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RESERVE

BLACK CURRANT SPREADS WHITE-PINE BLISTER RUST[1]

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BLACK CURRANT IS NURSE OF BLISTER RUST

The European black currant (*Ribes nigrum* L.) is not extensively grown in the United States but is found to some extent in most sections where currants are cultivated. As its name indicates, it is of European origin. It is commonly called cultivated black currant. Under the conditions existing when it was first brought into the United States, this plant did no harm, but the introduction of the white-pine blister rust has changed the situation.

White-pine blister rust (*Cronartium ribicola* Fischer) is a fungous disease destructive to white (5-needled) pine trees. It can attack these trees only after it has undergone a period of development on the leaves of currant or gooseberry plants. This disease is comparatively new to North America. It was introduced from Europe on white-pine planting stock at various times between 1898 and 1910, and has become established in both the eastern and western portions of the United States.[2]

European black currant is a nurse plant for white-pine blister rust. So extremely susceptible is this species to the white-pine blister-rust disease, thereby favoring its rapid spread and establishment, that the United States Department of Agriculture recognizes the cultivated black currant as a distinct menace to the white-pine timber supply of the country. It is so serious a danger to the production of white-pine timber as to make this kind of currant a public nuisance in all States where white (5-needled) pines grow. The department advises against the growing of this species of currant anywhere in the United States and recommends that State authorities, nurserymen, and growers take active steps to accomplish its prompt elimination from the Pacific, Rocky Mountain, Atlantic, Appalachian, Ohio Valley, upper Mississippi Valley, and Lake States. The growing of European black currants, in home gardens as well as in nurseries and commercial plantings, should be entirely abandoned throughout these States, because of the great importance of the white pines and the relatively small value of the black currants.

BLISTER-RUST CONTROL

The department, in cooperation with the infected States, has developed means for preventing blister-rust damage to white pines in a given tract or area. Such local control of the blister rust is feasible only in localities where pine values are sufficiently large to warrant the expense and labor of ridding the area of wild and cultivated currant and gooseberry bushes. This work must be done before the white-pine forests are severely attacked; hence it is important to apply general measures to retard the spread of the blister rust into uninfected regions. The principal general control measures are the enforcing of quarantines that regulate or entirely prevent the movement of the host plants of the blister rust, the eradication of European black currants, the regulated planting of other kinds of currants and of gooseberries, and the sanitation of nurseries against the disease in order that only healthy pines shall be planted.

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[1] This publication is a revision, with illustrations added, of the following article: DETWILER, S. B. BLACK CURRANT IS NURSE OF BLISTER RUST. U. S. Dept. Agr. Yearbook 1926: 171–175. 1927.

[2] The infected States include the New England States, New York, New Jersey, Pennsylvania, Michigan, Wisconsin, Minnesota, Idaho, Montana, Washington, and Oregon.

BLISTER-RUST FUNGUS

The blister-rust disease is caused by a parasitic fungus which grows within the tissues of its host plants (5-needled pines, currants, and gooseberries). It saps the life of these plants. Currant and gooseberry bushes are defoliated by the rust when infection is severe, resulting in reduction of the yield of fruit. On white pines the disease first causes the death of twigs and finally kills the trees. It kills white pines of all ages and, unless controlled, prevents the growing of these trees in areas where currants and gooseberries are abundant.

The disease does not pass directly from pine to pine, but only from pine to currants or gooseberries. However, the rust spreads from one currant or gooseberry bush to another, causing the underside of the leaves to appear as if spotted with iron rust. The spores (reproductive bodies) of this currant-rust stage may retain their germinating power for several weeks. The spores from a diseased pine are also long lived and may retain their power to infect currants or gooseberries for months.

There is still another and vitally important stage in blister-rust infection—the pine-infecting stage. A close knowledge of the life history of any plant pest usually discloses some point on which human intelligence can base control measures to reduce the damage caused by the pest and limit its spread. Thus our knowledge of the extreme susceptibility of European black currant to blister-rust infection is helpful in checking the rapid advance of the disease into uninfected regions. After the blister rust reaches the white-pine forests, local control of the disease rests upon the peculiarity of the pine-infecting stage of the rust.

The pine-infecting stage begins to develop shortly after the currant-rust stage. It appears as a feltlike mass of tiny hairs on the underside of the infected currant and gooseberry leaves. These hairs produce blister-rust sporidia, or spores of exceedingly small size, which are so delicately formed that they retain their vitality for a comparatively brief period and can infect a pine tree only under special conditions of humidity and temperature. Owing to the short life of the sporidia, white pines are infected only within a short radius of the diseased bushes. Even the extremely susceptible European black currants seldom spread infection to pines growing more than a mile from them.

REMEDY IS DEMONSTRATED

It has been conclusively demonstrated during the last 12 years that under ordinary forest conditions in the eastern United States white-pine forests suffer no further appreciable damage from blister rust after all currant and gooseberry bushes are removed from the pine area and from a surrounding zone 900 feet in width. European black currants must be removed within at least a 1-mile radius of the pines, and in addition it is occasionally necessary to remove plantations containing large numbers of plants of other species of currants or gooseberries within the same radius. More facts are required before the exact width of the protective zone under western forest conditions can be definitely specified. Probably it will not vary greatly from the distance found effective for local control of the blister rust in the Eastern States.

White-pine blister rust attacks trees of any species belonging to the white-pine group. The white pines commonly have five needles within the sheath which envelops the base of a leaf cluster; hence they are also known as 5-leafed pines. Some of our most valuable American timber trees are menaced by the blister rust. Among these are the well-known white pine (*Pinus strobus* L., also known as the northern white pine), widely distributed in the eastern and northern United States; sugar pine (*P. lambertiana* Dougl.), found in California and Oregon; and western white pine (*P. monticola* D. Don), which occurs in Montana, Idaho, Washington, Oregon, and California.

The future timber supply of the United States depends upon systematic forestry. No trees have more desirable qualities for forestry purposes than the white pines. These species are readily reproduced, grow rapidly, and yield more in merchantable timber and in money value per acre than is common with other kinds of forest trees. The result is that forestry development in many States centers prominently around white pine, western white pine, and sugar pine as major species in forest management. All white-pine species have high ornamental value also and are planted as lawn trees and, to some extent, for windbreak and shelter-belt purposes.

The common history of white-pine blister rust since its introduction into the United States is that European black currants "catch" blister-rust infection in localities far from any infection center, causing the disease to advance by leaps and bounds. Many examples of such long-distance spread are recorded. In one instance cultivated black-currant plants 110 miles from any white pines were infected. A careful investigation was made, and all facts indicated clearly that the blister-rust spores causing this infection had been carried at least 110 miles by the wind. When it has thus reached a new point the rust soon completely covers the under surface of the foliage of all European black currants in the vicinity of the plant first infected. Other kinds of currants or gooseberries which grow close to the infected black currants may also show a small amount of the disease. The disease is usually confined to European black currants until near-by white pines become infected, after which all kinds of currant and gooseberry plants in the vicinity develop more or less rust.

CULTIVATED BLACK CURRANTS RESPONSIBLE

Cultivated black currants have been largely responsible for failure of the efforts to eradicate the blister rust, because the disease had spread long distances to black currants before the infected pine plantations were destroyed. They have been responsible for firmly establishing the blister rust in hundreds of square miles of white-pine forests which would have remained free from rust for many years if there had been no black currants present. Thousands of square miles of white-pine forests are still free from the rust and if possible must be kept free.

Nurseries producing white pines or currants and gooseberries should distribute plants guaranteed to be free from white-pine blister rust. This can be done, but not while European black currants are growing in the locality. At least nine-tenths of all rust-infected white pines in nurseries have been due to the proximity of these pernicious plants. So long as such black currants are permitted to exist in the pine-growing States, shipment of white pine, currant, and gooseberry nursery stock from infected States must be closely restricted. If the black-currant plants have been generally eradicated, healthy white-pine stock can be produced from seed sown in an area entirely free from all other kinds of currant and gooseberry plants for a distance of 1,500 feet around the nursery beds. Certain wild currants, such as *Ribes bracteosum* Dougl. and *R. petiolare* Dougl. (found in the West), may have to be removed within a greater distance than 1,500 feet of the nursery, and also any large aggregation of *R. aureum* Pursh, *R. odoratum* Wendl., and *R. sanguineum* Pursh.

The total value of all European black currants in the United States is estimated to be $898,000, if each bush is worth $1.25 (an excessive value). The value of the merchantable 5-needled pine timber of the United States is estimated at about 417,583,000, or 465 times as great as the total value of the black-currant plants. The future value of the young pine already growing must be estimated in terms of national necessity rather than money.

Blister rust threatens the future of the white-pine forests. Cultivated black currants accelerate the advance of this disease. The United States can do without them better than it can suffer the blister-rust losses, due directly and indirectly to their cultivation. Federal plant quarantine No. 63 prohibits the interstate movement of European black currants from any State into the 36 States having native white-pine forests and in which the planting of white pine is of great economic importance. These currants have been eradicated from Oregon, Idaho, Montana, and eastern Washington, and California will soon be free from them. In the East they have been eradicated from large areas in New England and New York and to some extent in the Lake States and in Pennsylvania and New Jersey. Public welfare will best be served if the European black currant is declared a public nuisance and its growing discontinued in every State.

The accompanying illustrations (figs. 1, 2, 3, and 4) show graphically how the black currant spreads white-pine blister rust and how the pines may be protected.

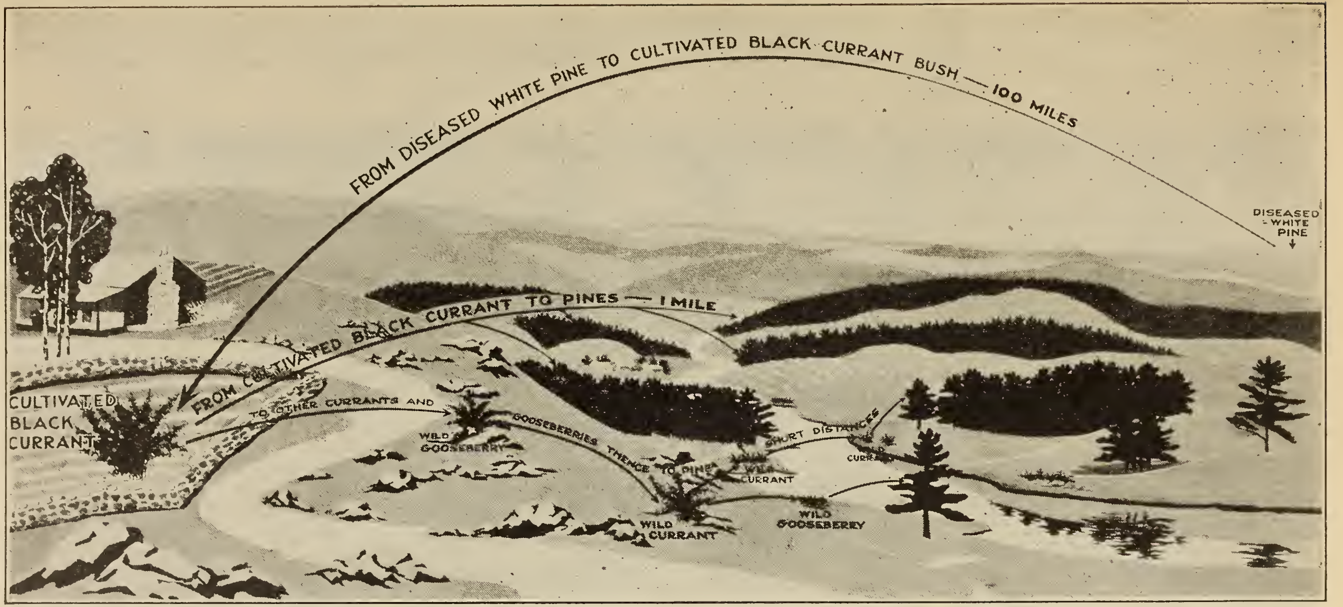
FROM DISEASED WHITE PINE TO CULTIVATED BLACK CURRANT BUSH — 100 MILES
DISEASED WHITE PINE
FROM CULTIVATED BLACK CURRANT TO PINES — 1 MILE
CULTIVATED BLACK CURRANT
TO OTHER CURRANTS AND GOOSEBERRIES THENCE TO PINE
WILD GOOSEBERRY
SHORT DISTANCES
WILD CURRANT
CURRANT
WILD CURRANT
WILD GOOSEBERRY

Fig. 1.—HOW BLISTER RUST SPREADS INTO UNINFECTED REGIONS

Cultivated black-currant bushes take a leading part in the long-distance spread and establishment of white-pine blister rust. The tiny spores of the blister rust produced on diseased white-pine trees float in the air for great distances, but they can infect only currant and gooseberry plants. At great distances from white-pine trees diseased with the blister rust cultivated black-currant plants are much more likely to become diseased than other kinds of currants or gooseberries. After the highly susceptible cultivated black currants are infected the disease spreads to other near-by currant and gooseberry bushes and to white pines. It does not spread directly from pine to pine, but must first pass through stages of growth on currant and gooseberry leaves. The arrows in the diagram tell the story of the spread of blister rust. The source of the rust spores is a diseased pine 100 miles from a healthy cultivated black-currant bush in a garden. After the spores reach this bush all of its leaves become heavily rusted and the disease spreads to near-by currant and gooseberry bushes of other kinds. Then another stage of the rust forms on the diseased currant and gooseberry leaves and infects white-pine trees near them with the disease.

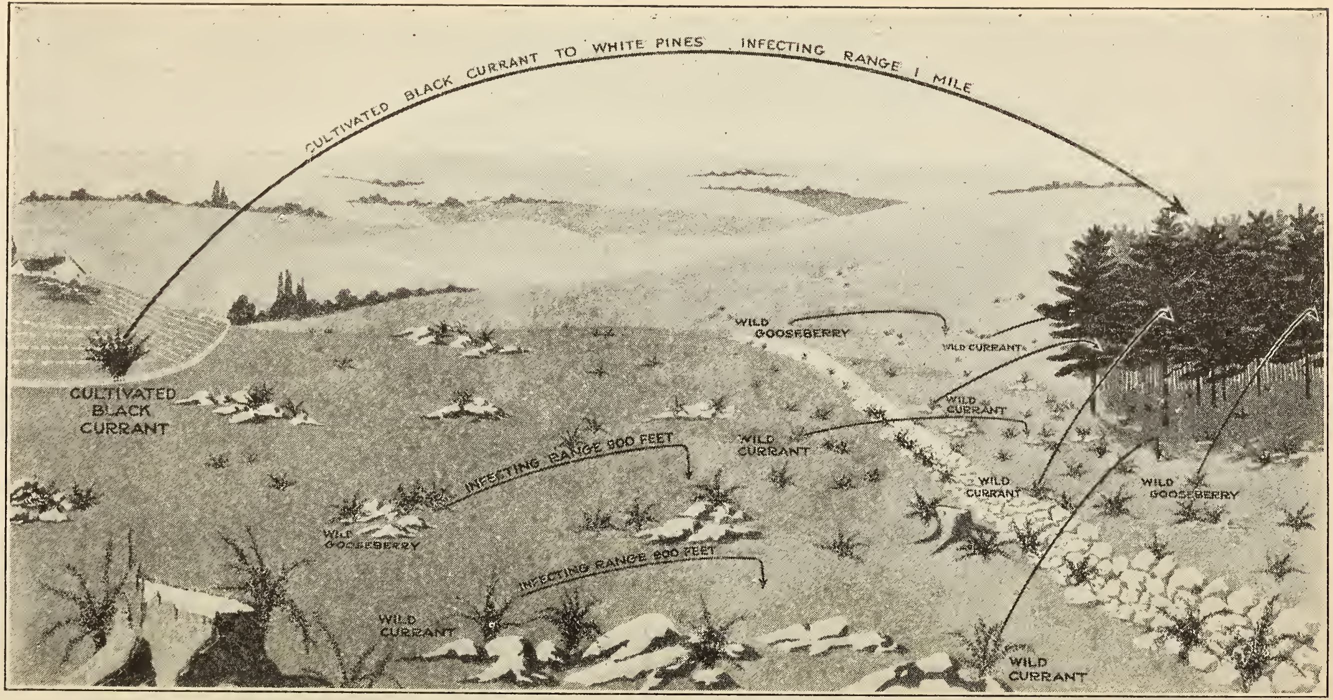

FIG. 2.—HOW BLISTER RUST ATTACKS WHITE-PINE FORESTS

This diagram illustrates in detail what happens after white-pine blister rust infects the currant and gooseberry bushes. The arrows show the usual maximum distance to which the pine-infecting spores can spread the rust from diseased bushes to white-pine trees. It will be noted that the maximum pine-infecting range is 1 mile for cultivated black currant and only 900 feet for other kinds of currants and gooseberries. The diagram is also intended to show that wild currant and gooseberry bushes are often numerous and widely distributed in pine regions. They grow in the open fields and in the woods, but are very commonly associated with rocks, stone walls, fence rows, roadsides, streams, and swamps.

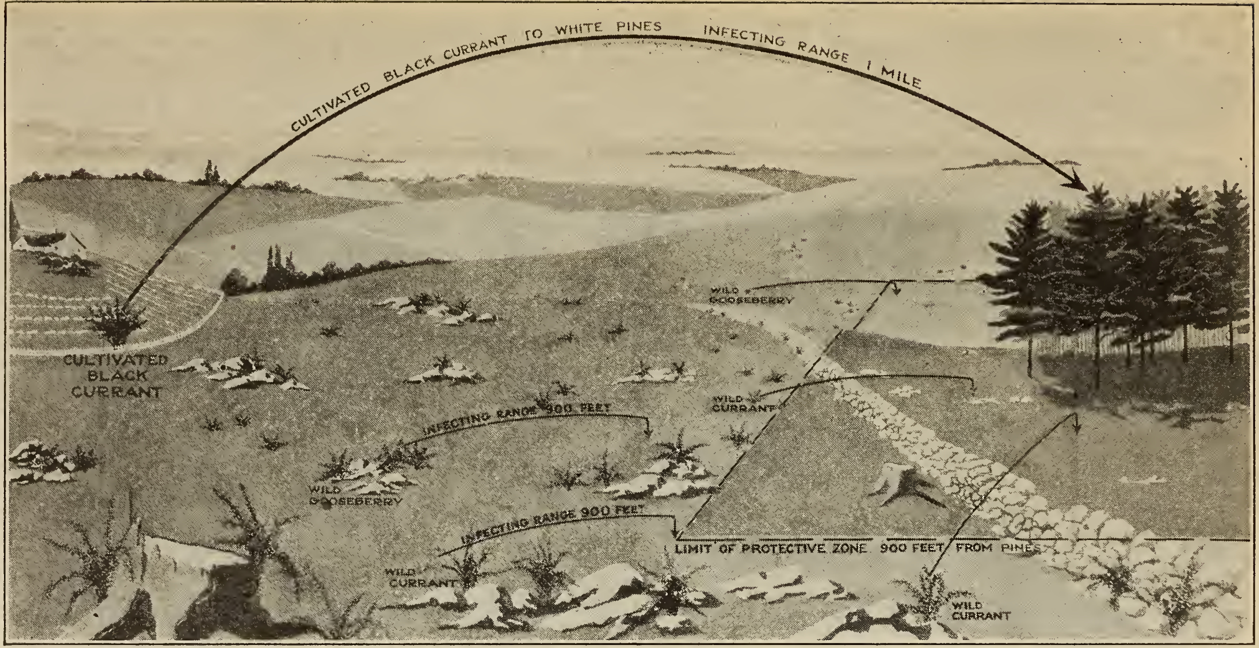

FIG. 3.—HOW CULTIVATED BLACK CURRANTS DESTROY THE EFFECTIVENESS OF BLISTER-RUST CONTROL

Local control of white-pine blister rust is accomplished by pulling up all currant and gooseberry bushes (both wild and cultivated) in a protective zone 900 feet wide around the pine trees. Of course all the currant and gooseberry bushes in the pine wood lot also must be destroyed. In addition all cultivated black currants need to be removed within a radius of 1 mile of the white pines. The diagram shows that the wild currant and gooseberry bushes were destroyed in the pine stand and for 900 feet around it, but the damaging blister-rust disease continues to spread into the pine stand from the cultivated black-currant bush less than a mile away. The blister-rust spores from other currant and gooseberry bushes outside of the protective zone die before they reach the pine stand, as indicated by the arrows.

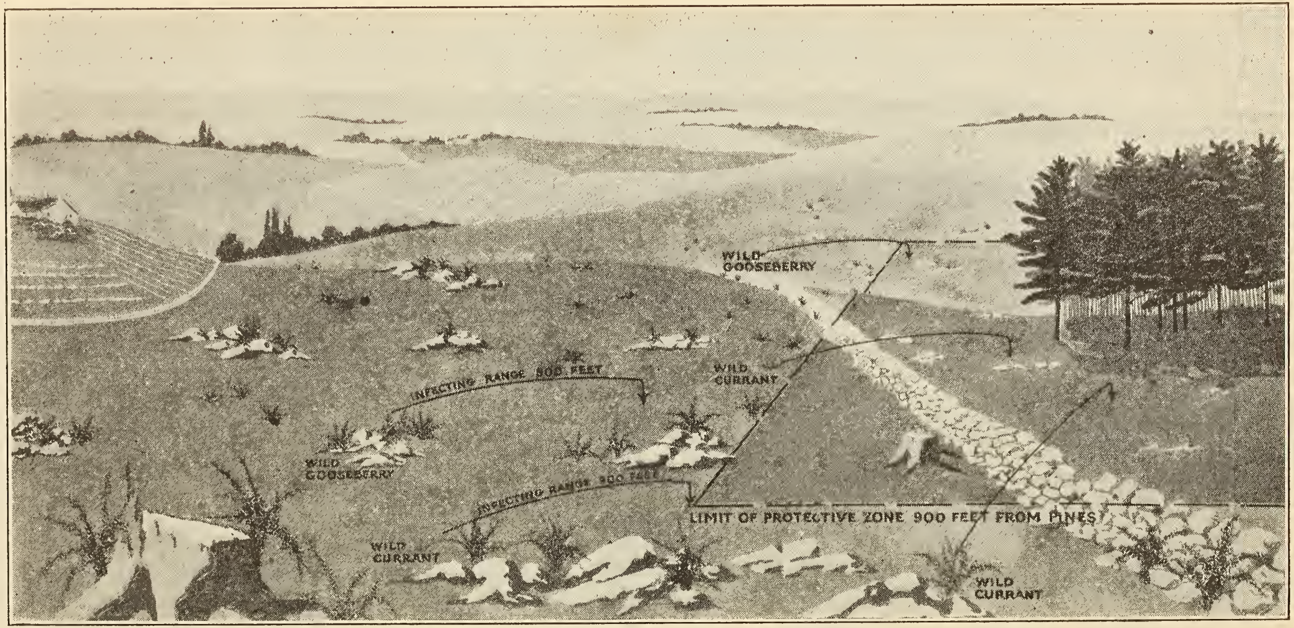

FIG. 4.—WHITE-PINE WOOD LOT FULLY PROTECTED FROM BLISTER-RUST DAMAGE

This diagram shows that all wild currant and gooseberry bushes have been destroyed in the pine stand and in the protective zone 900 feet on all sides of it. Also the cultivated black-currant bush shown in Figure 3 has been destroyed. If these conditions are maintained, the white-pine trees in the wood lot will mature without being seriously damaged by the blister rust, provided the disease has not infected the pines severely before the bushes were destroyed. While diseased bushes outside of the protective zone can not harm the white-pine stand shown in the illustration, they prevent young white pines from springing up in the protective zone and in the adjacent pasture. For this reason, and also to prevent the currant and gooseberry bushes from seeding back into the control areas from which they have been removed, it is often advisable to eradicate currant and gooseberry bushes throughout the general localities where extensive natural forest growth of white pine occurs.

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